

## 15.

The Templeton Crocker Expedition. X. Echinoderms from the West Coast of Lower California, the Gulf of California and Clarion Island<sup>1</sup>.

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(Text-figures 1 &amp; 2).

[Note: This is the tenth of a series of papers dealing with the specimens collected on the Twenty-fourth or Templeton Crocker Expedition of the Department of Tropical Research of the New York Zoological Society; William Beebe, Director. For data on dredges, localities, dates, etc., concerning the capture of specimens treated in this paper, refer to the present volume of *Zoologica*, No. 2, pp. 33 to 46.]

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## INTRODUCTION.

The collection of echinoderms made by the Templeton Crocker Expedition of the New York Zoological Society on the yacht *Zaca* to the Gulf of California and adjacent waters in the spring of 1936 is of great interest. With the exception of *Ophiura lütkeni*, of which there are 1,844 specimens, the collection is rich in quality but not in quantity. It consists of 2,277 specimens representing 65 species, viz., 27 sea-stars, 21 ophiurans, 16 echini and 1 crinoid<sup>2</sup>. There are two new brittle-stars which are described in this report. No fewer than 28 species are represented by only one or two specimens and some of these species have not been taken previously since they were described more than 20 years ago. A number of specimens were badly crushed and in poor condition; only one sea-star, however, was unidentifiable.

The region explored is on the boundary between the Panamic fauna and the North Pacific fauna; however, 31 species have been previously taken in the Panamic region, 22 species are of the North Pacific fauna, while 12 species are confined to the Gulf of California. It is interesting that several species were taken that had not been recorded since Verrill described them in 1871. The farther south one collects it becomes more and more evident that the North Pacific littoral species occur only in the deeper water; most of the material was taken at depths of less than 100 fathoms. The richest littoral stations were Santa Inez Bay in the Gulf of California, and Sulphur Bay, Clarion Island. Of the new brittle-stars one belongs to the large genus *Ophiacantha*, while the other is a representative of the genus *Ophiuroconis*.

I wish to express my indebtedness to Dr. William Beebe for the opportunity of studying this interesting material. Thanks are also due to Dr. H. L. Clark and Dr. E. Deichmann for their invaluable help in working up the material, and to Dr. W. K. Fisher for his expert assistance in determining some of the difficult sea-stars. Dr. Deichmann and Dr. Fenner A. Chace, Jr., have generously read the proofs.

The field color notes were made by members of the expedition.

The specimens are all deposited in the collections of the Museum of Comparative Zoölogy, Cambridge, Massachusetts.

<sup>2</sup> The holothurians taken have been discussed by Dr. E. Deichmann in the present volume of *Zoologica*, pp. 161 to 176.

## CLASS CRINOIDEA.

## Family Antedonidae.

***Florometra perplexa* (A. H. Clark).**

*Antedon perplexa* A. H. Clark, 1907, p. 74.

*Florometra perplexa*, A. H. Clark, 1921, p. 60, pl. 62, figs. 95, 96; pl. 5, figs. 1009-1014.

*Type*: Cat. No. 22611, U. S. N. M.

*Type Locality*: Off the coast of Washington, *Albatross* Station No. 3070.

*General Range*: From Alaska and Monterey Bay to the Gulf of Panama and the Galápagos Islands. From 45 to 581 fathoms.

*Local Distribution*: One adult from west of San José Point, Lower California (Station 175:D-1) at a depth of 45 fathoms on a shaley bottom.

*Remarks*: This interesting crinoid is the only one in the collection. It is a good-sized specimen and the color in life was reddish-brown, pinules dark brown to black, cirri light brown. Length of arms 111 mm., longest cirrus 33 mm.

## CLASS ASTEROIDEA.

## Family Astropectinidae.

***Astropecten armatus* Gray.**

*Astropecten armatus* Gray, 1840, p. 181.

*Astropecten armatus*, Fisher, 1911, p. 56.

*Type*: British Museum.

*Type Locality*: Puerto Portrero, South America (Gray).

*General Range*: From San Pedro, California, to Punta Santa Elena, Ecuador. From shore to 80 fathoms.

*Local Distribution*: A total of 21 specimens was taken from Magdalena Bay, Gorda Banks, Arena Bank, the Inez area and Clarion Island between three feet and 80 fathoms on muddy, sandy and rocky bottoms.

*Remarks*: This series is composed mainly of young specimens ranging in size from R = 5 mm. to R. = 146 mm.; the ratio between arms and disk radius rises from R = 2.5 r to R = 5.5 r. The supero-marginal spines are developed even in the smallest individuals. The color in life was usually pink, sometimes scarlet. The color of the dried specimens ranges from pale green to light brown, with the small ones cream color.

*Material*: Magdalena Bay: (2 young). Station 136: D-1 (3 young). Station 142: D-1 (1 adult). Station 143: D-1 (3 young), D-3 (5 young). Station 145: D-1 (1 adult). Station 150: D-9 (1 young), D-13 (2 young), D-16 (2 young). Station 163: D-3 (1 young).

***Astropecten californicus* Fisher.**

*Astropecten californicus* Fisher, 1906, p. 299.

*Astropecten californicus*, Fisher, 1911, p. 61.

*Type*: No. 157, Stanford University Invertebrate Collection.

*Type Locality*: Monterey Bay, California; 70 fathoms.

*General Range*: From north of Bodega Head, California, to Lower California, Mexico. From 10 to 244 fathoms.

*Local Distribution:* A total of five specimens was taken off San José Point, Lower California, from east of Cedros Island and on Gorda Banks between 38 and 70 fathoms on muddy and shaley bottoms.

*Remarks:* This series is composed entirely of young individuals, ranging from  $R = 13$  mm. to  $R = 22$  mm. The color of the dried specimens is brown in diverse shades; color in life pinkish.

*Material:* Station 126: D-1 (1 young). Station 150: D-4 (1 young). Station 175: D-1 (3 young).

### ***Thrissacanthias penicillatus* (Fisher).**

*Persephonaster penicillatus* Fisher, 1905, p. 297.

*Thrissacanthias penicillatus*, Fisher, 1911, p. 79.

*Type:* Cat. No. 22329, U. S. N. M.

*Type Locality:* Off Los Coronados Islands, southwest of San Diego, California. From 530 to 638 fathoms.

*General Range:* From Washington to Lower California. From 30 to 822 fathoms.

*Local Distribution:* One young individual was taken in Santa Inez Bay (Station 142: D-2) at a depth of 30 to 35 fathoms on a bottom composed of mud and crushed shell.

*Remarks:* Although no young specimen in the M. C. Z. collection is as small as the *Zaca* specimen, comparison shows that this individual is probably the young of *T. penicillatus*, but it is the first specimen recorded from the Gulf of California, and the first from a depth of less than 277 fathoms.  $R = 6$  mm.;  $r = 2$  mm. The color (dried) is light brown with lighter rays.

### ***Sideriaster canaliculata* A. H. Clark.**

*Sideriaster canaliculata* A. H. Clark, 1916, p. 52.

*Type:* Cat. No. 36951, U. S. N. M.

*Type Locality:* Gulf of California, 40 fathoms, *Albatross* Station 2998.

*General Range:* Gulf of California, Santa Inez Bay to Arena Bank. From 35 to 60 fathoms.

*Local Distribution:* A total of 12 specimens was taken from Gorda Banks, Arena Bank and the Inez area between 35 and 60 fathoms on muddy bottoms.

*Remarks:* These are the first specimens to be collected since the species was described in 1916. The series is interesting because of the diversity in size, ranging from  $R = 4$  mm. to  $R = 87$  mm. In the smallest specimen,  $R = 2$  r but as growth proceeds,  $R$  increases disproportionately until in the largest it considerably exceeds 3 r. A. H. Clark's type has  $R = 64$  mm. and  $r = 19$ . The color of the larger dried specimens at hand is brownish-white, the color in life was pinkish to coral red.

*Material:* Station 136: D-14 (1 young). Station 142: D-3 (2 adults, 2 young). Station 146: D-1 (1 young). Station 147: D-2 (1 young, tip of an adult ray). Station 150: D-9 (5 young).

### Family Luidiidae.

#### ***Luidia bellonae* Lütken.**

*Luidia bellonae* Lütken, 1865, p. 133.

*Luidia bellonae*, H. L. Clark, 1910, p. 330.

*Type*: Probably in Copenhagen.

*Type Locality*: Guayaquil, Ecuador.

*General Range*: Gulf of California to Iquique, Chile, and the Galápagos Islands. From 2 to 30 fathoms.

*Local Distribution*: A total of 4 specimens was taken from Santa Inez Bay, Station 142: D-1 (1 adult), and Station 143: D-1 (3 young), between 29 and 30 fathoms on muddy bottoms.

*Remarks*: This series was in very poor condition, probably being broken in the dredge. Largest specimen  $R = 115$  mm.;  $r = 13$  mm. The smaller specimens were in too poor condition to permit measurement. The color of the large specimen was lavender in life, and, dried, it is gray with dark cross-bands on the arms. The dorsal spines are light gray; the longest are 4 mm. in length; marginal spines about 5 mm. long, gray at base with white tips.

### ***Luidia columbia* (Gray).**

*Petalaster columbia* Gray, 1840, p. 183.

*Luidia columbia*, Sladen, 1889, p. 247. H. L. Clark, 1910, p. 331.

*Type*: British Museum.

*Type Locality*: "St. Blas," probably the west coast of Mexico.

*General Range*: From Magdalena Bay and the Gulf of California to northern Peru and the Galápagos Islands. From two to 80 fathoms.

*Local Distribution*: A total of 15 specimens was taken from east of Cedros Island, from Gorda Banks, Arena Bank, Santa Inez Bay and Clarion Island, between two and 80 fathoms on muddy, sandy and hard bottoms and in coral (*Pocillopora ligulata*).

*Remarks*: This series ranges in size from  $R = 8$  mm. to  $R = 213$  mm. The color of the dried specimens is brown of diverse shades, with white spines and oral surface. Several specimens have white and brown irregular markings on the disk and arms. The color in life was coral pink with orange spines.

*Material*: Station 126: D-3 (1 adult). Station 127: D-1 (tip of ray). Station 136: D-1 (1 adult), D-33 (1 adult). Station 142: D-3 (2 young). Station 143: D-3 (3 young). Station 147: D-2 (1 adult, 3 young). Station 150: D-13 (1 adult), D-16 (1 adult). Station 163: D-3 (1 adult).

### ***Luidia foliolata* Grube.**

*Luidia foliolata* Grube, 1866, p. 59.

*Luidia foliolata*, Fisher, 1911, p. 106.

*Type*: Unknown.

*Type Locality*: Unknown.

*General Range*: From southeast Alaska (Kasaan Bay) to San Diego, California, and probably to Mazatlan. From 10 to 189 fathoms, usually less than 80 fathoms.

*Local Distribution*: Three specimens were taken west of San José Point, Station 175: D-1 (1 adult, 2 young), at a depth of 45 fathoms.

*Remarks*: These specimens are well preserved and in good condition. Size ranges from  $R = 15$  mm.;  $r = 4$  mm. to  $R = 91$  mm.;  $r = 8$  mm. The color of the dried specimens is brown with white spots irregularly scattered on the disk and arms; bordering the marginal plates are rows of white paxillae; oral surface dirty yellow.

The known range is extended to Lower California by this record which is the farthest south the species has been taken.

**Luidia phragma** H. L. Clark.

*Luidia phragma* H. L. Clark, 1910, p. 329.

*Type*: No. 398, M. C. Z.

*Type Locality*: Probably Peru.

*General Range*: Gulf of California to Peru. From three feet to 30 fathoms.

*Local Distribution*: A total of four specimens was taken on the shore of Magdalena Bay and in Santa Inez Bay at three feet and 13 fathoms.

*Remarks*: Of this colorful species the smallest specimen has  $R = 35$  mm., the largest  $R = 45$  mm. The third row of paxillae from the marginal plates bears spines. The color of the dried specimens is gray, with each arm having a brown stripe down the center; the margins have black bars, one in each inter-radius and 3 to 4 on the arms, but in one specimen these bars are not so distinct. The oral side and lateral spines are white.

*Material*: Magdalena Bay: (1 adult). Station 145: D-1 (3 adults).

## Family Odontasteridae.

**Odontaster crassus** Fisher.

*Odontaster crassus* Fisher, 1904, p. 302.

*Odontaster crassus*, Fisher, 1911, p. 156.

*Type*: Cat. No. 22333, U. S. N. M.

*Type Locality*: Albatross Station 4313, vicinity of San Diego. From 92 to 243 fathoms.

*General Range*: Monterey Bay to San Diego, and northern Lower California. From 43 to 243 fathoms.

*Local Distribution*: One young specimen was taken west of San José Point (Station 175: D-1) at a depth of 45 fathoms on a shaley bottom.

*Remarks*: The specimen has  $R = 12$  mm. The color (dried) is cream on the marginal plates and oral side; the paxillar area is light brown.

The known range is extended about 100 miles to the south by this record.

## Family Goniasteridae.

**Mediaster aequalis** Stimpson.

*Mediaster aequalis* Stimpson, 1857, p. 530, pl. 23, figs. 7-11.

*Mediaster aequalis*, Fisher, 1911, p. 198.

*Type*: Cat. No. 1977, U. S. N. M.

*Type Locality*: Puget Sound, Washington, or San Francisco.

*General Range*: From the Alaska Peninsula (Chignik Bay) to northern Lower California. From 9 to 160 fathoms.

*Local Distribution*: A total of four specimens was taken west of San José Point, Lower California (Station 175: D-1, 2 young; D-3, 2 adults) at a depth of 45 fathoms on shaley bottom.

*Remarks*: The smallest specimen  $R = 7$  mm., largest  $R = 38$  mm. Color (dried) is a dirty cream; the madreporite is light buff; color of adults in life, bright red.

**Amphiaster insignis** Verrill.

*Amphiaster insignis* Verrill, 1868, p. 372.

*Type*: Cat. No. 581, M. C. Z. (cotype).

*Type Locality*: La Paz, Lower California.

*General Range*: Magdalena Bay and Gulf of California. From 30 to 45 fathoms.

*Local Distribution*: A total of 18 specimens was taken from Arena Bank and Santa Inez Bay between 18 and 45 fathoms on sandy and muddy bottoms.

*Remarks*: In the smallest specimen  $R = 9$  mm.; in the largest  $R = 59$  mm. The color (dried) is a light dirty brown; the color in life was pale pink to carrot red.

*Material*: Station 136: D-1 (1 young, 6 adults), D-2 (1 young), D-13 (1 adult), D-26 (2 young, 1 adult). Station 141: D-3 (3 adults). Station 142: D-1 (2 young). Station 143: D-1 (1 adult).

#### Family Oreasteridae.

#### *Pauliella aenigma* Ludwig.

*Pauliella aenigma* Ludwig, 1905, p. 151.

*Type*: Cat. No. 2403, M. C. Z. (cotype).

*Type Locality*: Cocos Island, off Costa Rica, *Albatross* Station 3368.

*General Range*: Cocos and Clarion Islands. From 45 to 67 fathoms.

*Local Distribution*: One specimen was taken off Clarion Island (Station 163: D-2) at a depth of 55 fathoms on a rocky bottom with coral.

*Remarks*: This specimen has  $R = 16.5$  mm. and  $r = 11.5$  mm.; a cotype in the M. C. Z. has  $R = 13.5$  mm.,  $r = 9.5$  mm.; a large specimen with  $R = 16.5$  mm. and  $r = 12$  mm. was described by Ludwig and it agrees well with the present individual, especially in the ambulacral armature. The cotype and this individual differ from each other chiefly in the size of the dorsal and lateral spines. In the cotype the central dorsal spines, 5 in number (3 broken), are 1 mm. high, while the distal dorsal spines, arranged in 5 groups of 12 to 15, are 8 mm. high. The *Zaca* specimen has no central spines but 11 spheroidal naked plates surrounded at their base with series of granules. The distal dorsal spines are small and few, none exceeding 3 mm. in length. The inter-radial, intra-marginal spines are well developed in the cotype, where there are ten, conical and blunt, the longest 1 mm. in length. In the present specimen the intra-marginal spines are small and the area between the dorsal and ventral marginal plates is greatly reduced. These differences however are probably due to growth changes. With advancing age it may be that the spines are lost and the enlarged plates occupy their place.

The color (dried) is creamish-white both above and below; the triangular madreporite is light brown; each inter-radius dorsally has a light yellow area.

This is the first specimen of *Pauliella* to be recorded since the types were taken by the *Albatross* at Cocos Island in 1891. The known range is now extended to Clarion Island about 2,100 miles to the northwest.

#### *Oreaster occidentalis* Verrill.

*Oreaster occidentalis* Verrill, 1867a, p. 278.

*Oreaster occidentalis*, H. L. Clark, 1910, p. 333.

*Type*: Probably in Peabody Museum, New Haven.

*Type Locality*: West coast of Panama.

*General Distribution:* Gulf of California to northern Peru and the Galápagos Islands. From three to 40 fathoms.

*Local Distribution:* A total of three specimens was taken from Arena Bank and Santa Inez Bay between five and 45 fathoms on sandy and muddy bottoms.

*Remarks:* All the specimens at hand of this common species are small with R ranging from 47 to 91 mm. Their color in life ranged from orange to red; dried from alcohol it is brown with a reddish tinge; papular areas gray in both living and dried specimens.

*Material:* Station 136: D-6 (1 adult), D-23 (1 young). Station 141: D-1 (1 adult).

### ***Nidorellia armata* (Gray).**

*Pentaceros armatus* Gray, 1840, p. 277.

*Nidorellia armata*, Verrill, 1867a, p. 280; H. L. Clark, 1910, p. 332.

*Type:* Probably in the British Museum.

*Type Locality:* Punta Santa Elena, Ecuador. From 12 to 15 fathoms.

*General Range:* From Guaymas, Mexico, to Zorritos, Peru, and the Galápagos Islands. From shore to 40 fathoms.

*Local Distribution:* A total of three specimens was taken off Arena Bank and off Santo Domingo Point, Santa Inez Bay, between one and 2½ fathoms in coral (*Pocillopora ligulata*) and on a sandy bottom.

*Remarks:* In the smallest specimen R = 55 mm., in the largest R = 72 mm. The color in life was olive with dark blue spines. The armature varies greatly; there are 33 short, blunt, dorsal spines on the smallest specimen, and two to four blunt marginal spines at ray tips; in the largest specimen there are 104 short pointed dorsal spines, and marginal spines on all but four superomarginal plates. The intermediate specimen has 16 long, blunt, dorsal spines 10 mm. high; superomarginal spines near tip of ray, about four on each side 6 mm. long.

*Material:* Station 136: D-33 (1 adult). Near Station 145: (2 adults).

### Family Ophidiasteridae.

### ***Linckia columbiae* Gray.**

*Linckia columbiae* Gray, 1840, p. 285.

*Linckia columbiae*, Fisher, 1911, p. 242.

*Type:* Probably in the British Museum.

*Type Locality:* "West coast of Colombia" (Gray).

*General Range:* San Pedro, California, to Colombia and the Galápagos Islands. From shore to 55 fathoms.

*Local Distribution:* A total of three specimens was taken from Arena Bank and off Clarion Island between 45 and 55 fathoms on muddy and rocky bottoms.

*Remarks:* The largest specimen has R = 55 mm., the smallest 51 mm. All have five arms, but one has two arms, 12 and 21 mm. in length, in process of regeneration. Color of the dried specimens light tan.

*Material:* Station 136: D-1 (2 adults). Station 163: D-2 (1 adult).

### ***Narcissia gracilis* A. H. Clark.**

*Narcissia gracilis* A. H. Clark, 1916, p. 58.



*Type:* Cat. No. 38,317, U. S. N. M.

*Type Locality:* Albatross Station 2829, off Lower California, 31 fathoms.

*General Range:* Gulf of California. From 31 to 50 fathoms.

*Local Distribution:* A total of nine specimens was taken from Arena Bank and Gorda Banks between 45 and 50 fathoms on muddy and sandy bottoms.

*Remarks:* The specimens at hand are all young ( $R = 13$  to  $34$  mm.) and are more depressed than the adults, which have the arms decidedly triangular in cross-section. The species is rare, only a few having been taken since the type was described in 1916. The color of the living specimens ranged from coral pink to burnt orange; dried, they are yellowish-brown.

*Material:* Station 136: D-1 (1 young), D-13 (1 young), D-23 (2 young), D-26 (4 young). Station 150: D-10 (1 young).

### ***Phataria unifascialis* (Gray).**

*Linckia unifascialis* Gray, 1840, p. 285.

*Phataria unifascialis*, Sladen, 1889, p. 786; H. L. Clark, 1910, p. 335.

*Type:* Probably in the British Museum.

*Type Locality:* Bay of Caracas, west coast of Colombia.

*General Range:* From the Gulf of California to Zorritos, Peru. From shore to 10 fathoms.

*Local Distribution:* Two adults were taken from Arena Bank (Station 136: D-33) at a depth of two fathoms in coral (*Pocillopora ligulata*).

*Remarks:* This tropical species is abundant on rocky shores in the Panamic region and can easily be collected at low tide. The larger specimen in the Zaca collection has  $R = 58$  mm., while in the smaller  $R = 45$  mm.; both specimens show evidence of regeneration, so that neither is quite typical, the rays being short and heavy. The dried specimens are a bleached dirty cream color.

### ***Pharia pyramidata* (Gray).**

*Ophidiaster pyramidatus* Gray, 1840, p. 284.

*Pharia pyramidata*, Sladen, 1889, p. 784; H. L. Clark, 1910, p. 335.

*Type:* Probably in the British Museum.

*Type Locality:* Bay of Caracas, west coast of Colombia, on rocks.

*General Range:* From the Gulf of California to Punta Santa Elena, Ecuador; Zorritos, Peru, and the Galápagos Islands. From shore to 10 fathoms.

*Local Distribution:* One adult was taken from Arena Bank (Station 136: D-33) at a depth of two fathoms in coral (*Pocillopora ligulata*).

*Remarks:* The specimen has  $R = 66$  mm., and the color is brown with faded yellow papular areas.

### ***Leiaster teres* (Verrill).**

*Lepidaster teres* Verrill, 1871a, p. 578.

*Leiaster teres*, Sladen, 1889, p. 408.

*Type:* Probably in the Peabody Museum, New Haven.

*Type Locality:* La Paz, Lower California.

*General Range:* Confined to the Gulf of California. From 20 to 30 fathoms.

*Local Distribution:* One adult specimen was taken from Gorda Banks (Station 150: D-7) between 20 and 30 fathoms on a muddy bottom.

*Remarks:* This specimen is the first one to be collected since Verrill's type was taken by Captain J. Pedersen near La Paz. Verrill says the type was "pale yellow" when dried; probably it had been in alcohol for some time. The present specimen in life was brilliant cerise pink; at present it has faded to a dull rose. In his "Echinoderms of Torres Strait" (1921, p. 73) H. L. Clark refers to Verrill's ambiguity about the papular arrangement, but the specimen now at hand shows clearly that the papulae are grouped, thus leaving no doubt that it is a true *Leiaster*. The *Zaca* specimen has  $R = 44$  mm., about the same as in the type.

Family Echinasteridae.

***Henricia asthenactis* Fisher.**

*Henricia asthenactis* Fisher, 1910, p. 572.

*Henricia asthenactis*, Fisher, 1911, p. 297.

*Type:* Cat. No. 27,782, U. S. N. M.

*Type Locality:* Albatross Station 4423 between Santa Barbara and San Nicholas Islands, California. From 216 to 339 fathoms.

*General Range:* Vicinity of Santa Barbara Islands, Shumagin Islands, Bering Sea (Bowers Bank and off Kamchatka), and the Gulf of California. From 67 to 682 fathoms.

*Local Distribution:* A total of three specimens was taken from Gorda Banks between 50 and 75 fathoms on muddy and hard bottoms.

*Remarks:* These specimens extend the range of the species over a thousand miles to the south. The adult differs slightly from the northern form, but since the species of this genus vary greatly, it does not seem desirable to make it a named variety. It has  $R = 17$  mm., and the color in life was pinkish; dried it is cream with light brown papular areas. The two young specimens are six-armed, one regenerating three arms ( $R = 11$  mm., other arms  $R = 19$  mm.) and the other has two arms ( $R = 15$  mm. and four buds with  $R = 5$  mm.) The color is the same as in the adult.

*Material:* Station 150: D-9 (2 young), D-16 (1 adult).

***Henricia aspera* Fisher.**

*Henricia aspera* Fisher, 1906, p. 127.

*Henricia aspera*, Fisher, 1911, p. 393.

*Type:* Cat. No. 21,930, U. S. N. M.

*Type Locality:* Albatross Station 3052, Heceta Bank, Oregon, 48 fathoms.

*General Range:* From Bering Sea (Bering and Pribilof Islands), south to San José Point, Lower California. From 26 to 313 fathoms.

*Local Distribution:* One specimen was taken west of San José Point (Station 175: D-1) at a depth of 45 fathoms on a shaley bottom.

*Remarks:* This specimen has  $R = 34$  mm. It extends the known range of the species about 200 miles to the south.

***Henricia leviuscula dyscrita* Fisher.**

*Henricia leviuscula dyscrita* Fisher, 1911, p. 298.

*Type:* Cat. No. 27,780, U. S. N. M.

*Type Locality:* Albatross Station 2907, near Point Conception, California, at 44 fathoms.

*General Range:* Middle California to Cedros Island. From off shore to about 80 fathoms.

*Local Distribution:* A total of five specimens was taken west of San José Point, and east of Cedros Island at 45 and 60 fathoms on bottoms of shale and crushed shell.

*Remarks:* The smallest has R = 23 mm., in the largest it is 37 mm. This material extends the known range about 300 miles southward. The color of the adult in life was buffy-yellow.

*Material:* Station 126: D-10 (1 adult). Station 175: D-2 (4 young).

### ***Henricia polyacantha* Fisher.**

*Henricia polyacantha* Fisher, 1906, p. 129.

*Henricia polyacantha*, Fisher, 1911, p. 302.

*Type:* Cat. No. 21,932, U. S. N. M.

*Type Locality:* Albatross Station 2936, off San Diego, California, at 359 fathoms.

*General Range:* San Diego, California, to the Gulf of California. From 70 to 359 fathoms.

*Local Distribution:* One adult was taken from Gorda Banks (Station 150: D-13) at a depth of 70 to 80 fathoms on a rough bottom.

*Remarks:* The known range of *H. polyacantha* is extended about 100 miles to the south by this specimen which was pinkish in life, is pale cream color dried, and has R = 56 mm. This specimen is a southern variety but not distinctive enough to be named as a subspecies.

### ***Echinaster tenuispinus* Verrill.**

*Echinaster tenuispinus* Verrill, 1871a, p. 577.

*Echinaster tenuispinus*, H. L. Clark, 1913, p. 195.

*Type:* Probably in Peabody Museum, New Haven.

*Type Locality:* La Paz, Lower California.

*General Range:* Confined to the Gulf of California. From shore to 10 fathoms.

*Local Distribution:* Two young specimens were taken from Santa Inez Bay (Station 144: D-2) at a depth of 2½ fathoms, and one adult from the tidal zone of the same bay. The bottom in both cases was sandy.

*Remarks:* In the smallest specimen R = 4 mm., while in the largest R = 42 mm. The color of the dried specimen is brown with only the spine tips light; orally the ambulacra are pale yellow with light-colored spines.

Family Acanthasteridae.

### ***Acanthaster ellisii* (Gray).**

*Echinaster ellisii* Gray, 1840, p. 281.

*Acanthaster ellisii*, Verrill, 1869, p. 385.

*Type:* Probably in the British Museum.

*Type Locality:* South America?; H. Cuming, Esq., (Gray).

*General Range:* Gulf of California, Galápagos Islands and Clarion Island. From shore to 6 fathoms.

*Local Distribution:* One adult was taken from Sulphur Bay, Clarion Island, between one and 6 fathoms on a bottom formed of coral and rock.

*Remarks:* This seems to be a rare species, since less than a dozen specimens have been recorded. W. P. Sladen (*Rep. Voy. Challenger*, vol. 30, 1889, p. 536) doubts the validity of the species but later collectors have added specimens from other localities and it is now generally accepted.

One specimen when lifted into a boat was said to inflict a painful sting. Other specimens have been handled by the present writer without any stinging or other unusual sensations. It may be that a coelenterate had become accidentally enmeshed on the numerous spines of the sea-star and caused the stinging sensation reported. But it is possible that *Acanthaster* may possess poisonous pedicellariae as many sea urchins do. When more living specimens are taken, experiments should be carried out to determine the effect and source of the stinging, if any occurs.

The present specimen in life showed dorsally three concentric rings of rufous, apricot buff and rufous around a center of the apricot buff shades; spines dove gray basally, vinaceous pink distally; oral surface vinaceous pink; tube-feet greenish yellow; dorsal surface of rays dove gray, lateral portions rufous. In the dried specimen the dorsal spines are pale red, papular areas dark red, madreporites light gray, oral spines dirty white. There are 15 rays and 8 madreporitic plates;  $R = 85$  mm. and  $r = 51$  mm.

#### Family Heliasteridae.

##### ***Heliaster kubiniji*** Xantus.

*Heliaster kubiniji* Xantus, 1860, p. 568.

*Heliaster kubiniji*, H. L. Clark, 1913, p. 201.

*Type:* U. S. N. M.

*Type Locality:* Cerro Blanco, off Cape San Lucas, Lower California.

*General Range:* Gulf of California. From shore to five fathoms.

*Local Distribution:* Two small specimens were taken in three feet of water at Santa Inez Point, Santa Inez Bay, on a sandy bottom.

*Remarks:* This species is a common littoral form in the Gulf of California. Each of the present specimens has 23 rays,  $R = 60$  mm.;  $r = 33$  mm. Color (dried) dark brown, spines pale pink fading to white.

#### Family Asteriidae.

##### ***Sclerasterias heteropaes*** Fisher.

*Sclerasterias heteropaes* Fisher, 1928, p. 112.

*Type:* Cat. No. E. 1427, U. S. N. M.

*Type Locality:* Albatross Station 4554, N. W. Point Pinos, Monterey Bay, California, in 70 to 80 fathoms.

*General Range:* Half Moon Bay to south of San Diego, California, and Clarion Island. From 27 to 85 fathoms.

*Local Distribution:* A total of 11 specimens was taken west of San José Point, Lower California, and off Clarion Island at 45 to 55 fathoms on bottoms composed of shale and of rock with coral, respectively.

*Remarks:* This species is interesting in that the young may have either five or six arms (Fisher, 1928, p. 115). In the largest  $R = 21$  mm., smallest

R = 8 mm. The color of dried specimens is brown, with two whitish bands on each arm, the spines white. The specimens from Clarion Island establish a new southern limit for the known range of the species.

*Material:* Station 163: D-2 (2 young). Station 175: D-1 (9 young).

CLASS OPHIUROIDEA.

Family Ophiomyxidae.

***Ophiomyxa panamensis* Lütken & Mortensen.**

*Ophiomyxa panamensis* Lütken & Mortensen, 1899, p. 182.

*Type:* Cat. No. 2642, M. C. Z. (cotypes).

*Type Locality:* Albatross Station 3397, Panama.

*General Range:* Gulf of California to Panama. From 50 to 85 fathoms.

*Local Distribution:* A total of 15 specimens was taken from Arena Bank and Gorda Banks at depths of 50 fathoms on rocky and crushed shell bottoms.

*Remarks:* Unfortunately the specimens are crushed and broken but there is no doubt of their identity even though their occurrence near Lower California extends the known range of the species 2,000 miles to the north. The color of these specimens when dried is old rose; the disk, however, is dark red and the arm spines have yellow tips.

*Material:* Station 136: D-27 (7 disks and fragments). Station 150: D-10 (8 disks and fragments).

Family Gorgonocephalidae.

***Astrocaneum spinosum* (Lyman).**

*Astrophyton spinosum* Lyman, 1875, p. 29.

*Astrocaneum spinosum*, Döderlein, 1911, p. 92.

*Type:* Cat. No. 2912, M. C. Z.

*Type Locality:* West coast of Panama.

*General Range:* Panama to Lower California. From 10 to 46 fathoms.

*Local Distribution:* One specimen from Ceralbo Channel, (Station 137: D-1) at a depth of 46 fathoms.

*Remarks:* This specimen extends the known range of the species more than 2,000 miles to the north. The diameter of the disk is 30 mm., length of arm about 110 mm. The color of the dried specimen is pale brown with a dark, dorsal median line on arms.

Family Ophiacanthidae.

***Ophiacantha pyriformis* sp. nov.**

(Text-figure 1).

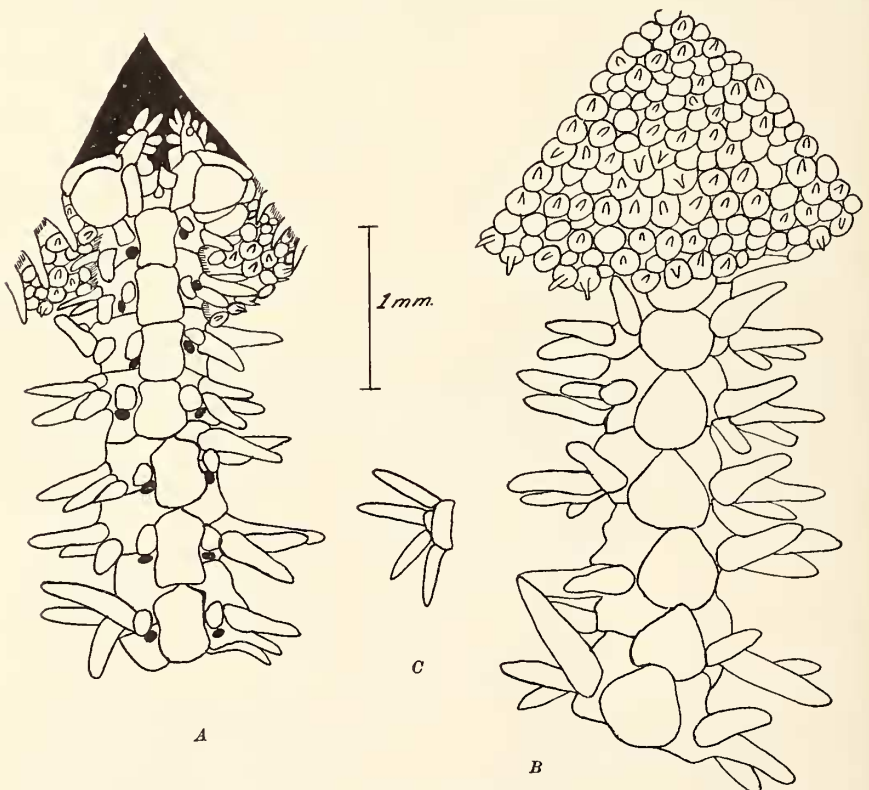
*Diagnosis:* Rays six; simple spinelets on disk scales; unique, well defined dorsal arm-plates; four short, stout, tapering arm-spines.

*Description:* Disk about 3 mm. in diameter, arms 6; old arms 13 mm. long; regenerated arms 6 mm. Disk covered with numerous, distinct, overlapping scales, each of the larger bearing a single, blunt, relatively smooth, tapering spinelet, less than 1 mm. in length; there is no definite arrangement in the distribution of spines. Radial shields covered with scales,

except at the distal margin. Basal upper arm-plates more or less circular, the second much larger than the first; subsequent plates becoming longer than wide but widest distally, pyriform, sharply defined, only slightly in contact with each other; the surface of all upper arm-plates is rough, like shagreen.

Interbrachial areas below covered with overlapping scales, some bearing short, blunt spines. Genital slits large. Oral shields oval, longer than broad, proximally more convex than distally. Adoral shields triangular, longer than broad, proximally pointed, increasing in width distally, meeting within in some areas, not in contact in others, due to regenerating rays. All plates more finely granulate than the upper arm plates. Teeth block-like and bluntly rounded, four in each column. Oral papillae two to four on each side of the jaw, according to the stage of growth, most proximal narrow and rounded; distally they become wider and flat with blunt tips; distal papilla widest. Second pair of oral tentacles with tentacle-scales.

First under arm-plate small, oval, distally and proximally convex; second and succeeding arm-plates longer than wide, sides slightly concave, proximal end pointed, distal margin broadly rounded; plates slightly in contact. Tentacle-scale single, large, oval and flat; distally it becomes slender and pointed. Side arm-plates large, narrowly separated above and below. Each



Text-figure 1.

*Ophiacantha pyriformis* sp. nov. **A**, oral side; **B**, aboral side; **C**, arm-spine arrangement.

plate bears four short, well spaced, smooth spines, tapering but blunt, the uppermost longest.

The color in dried alcoholic specimens is as follows: old arms and portion of the disk light brown; regenerated rays and parts of disk light gray; oral surface nearly white; arm-spines gray.

*Type*: M. C. Z. Cat. No. 5423 (holotype) and three paratypes (M. C. Z. 5424).

*Type Locality*: Clarion Island, Mexico.

*Material*: The holotype and three paratypes, taken off Clarion Island, (Station 163: D-1) at a depth of 20 fathoms on a bottom of rock and coral.

*Remarks*: Of the four specimens three have six arms, three large and three small, and one has three arms, the incomplete disk having four jaws. Evidently reproduction by fission when very young is the rule, but whether the adult has five or six arms, there is no means of knowing.

This species is readily distinguished from other species of the genus by the simple spinelets on the disk-scales, unique dorsal arm-plates and the four short stout arm-spines. It apparently is not closely allied to any known species, but additional material may show it to be the young of a larger, already named species.

#### Family Amphiuridae.

#### ***Amphiura arcystata* H. L. Clark.**

*Amphiura arcystata* H. L. Clark, 1911, p. 145.

*Amphiura arcystata*, Nielsen, 1932, p. 264.

*Type*: Cat. No. 3135, M. C. Z. (paratype).

*Type Locality*: Off Central California, Albatross Station 3132.

*General Distribution*: From California to the Gulf of California and Japan. From 30 to 330 fathoms.

*Local Distribution*: A total of seven specimens was taken east of Cedros Island and in Santa Inez Bay at 35 and 45 fathoms on muddy bottoms.

*Remarks*: The largest specimen is 12 mm. in disk diameter; while the longest arm measures 204 mm. The smallest specimen is 4 mm. across the disk and its longest arm is 40 mm. The dried specimens are light brown, the disk darker and radial shields lighter. This record extends the known range of the species to the Gulf of California, more than 1,200 miles to the south.

*Material*: Station 126: D-6 (3 adults). Station 143: D-4 (4 young).

#### ***Amphipholis squamata* (Delle Chiaje).**

*Asterias squamata* Delle Chiaje, 1828, p. 74.

*Amphipholis squamata*, Verrill, 1899, p. 312; Nielsen, 1932, p. 290.

*Type*: Unknown.

*Type Locality*: Mediterranean Sea, probably Naples.

*General Range*: Cosmopolitan, the most widely distributed of the brittle-stars. From shore to 100 fathoms.

*Local Distribution*: One specimen was taken east of Cedros Island (Station 125: D-1) at a depth of 44 fathoms on a muddy bottom.

*Remarks*: The disk diameter of the single specimen is 3 mm. with length of arms 7 mm. The disk is light gray, the arms light cream color in the dry specimen.

***Amphiodia urtica*** (Lyman).

*Amphiura urtica* Lyman, 1860, p. 195.

*Amphiodia urtica*, Verrill, 1899, p. 313; Nielsen, 1932, p. 279.

*Type*: Never designated.

*Type Locality*: Puget Sound, Washington.

*General Range*: From Shumagin Islands, Alaska, to Lower California. From 15 to 50 fathoms.

*Local Distribution*: Three young specimens were taken east of Cedros Island (Station 125: D-1) at a depth of 44 fathoms on a muddy bottom.

*Remarks*: The diameter of the disk in the largest specimen is 4 mm., while that of the smallest is 2 mm. The arms are 17 mm. in length. The disk is gray and the arms are cream color in the present material. This is the farthest south the species has been recorded.

***Ophiactis savignyi*** (Müller & Troschel).

*Ophiolepis savignyi* Müller & Troschel, 1842, p. 95.

*Ophiactis savignyi*, Ljungman, 1867, p. 323; Nielsen, 1932, p. 257.

*Type*: Unknown.

*Type Locality*: Egypt.

*General Range*: World-wide in the tropics; on the Pacific coast from San Pedro, California, to Panama. From shore to 27 fathoms.

*Local Distribution*: One young specimen was taken from Clarion Island (Station 163: D-1) at a depth of 20 fathoms on a bottom formed of coral and rock.

*Remarks*: This is a common tropical species, frequently found in sponges. The disk diameter of the present specimen is only 1.5 mm., length of arms, 7 mm. The dried specimen has the disk mottled green and black as usual and the arms marked with alternating bands of green and light brown.

***Ophiopholis bakeri*** McClendon.

*Ophiopholis bakeri* McClendon, 1909, p. 41.

*Ophiopholis bakeri*, Nielsen, 1932, p. 261.

*Type*: Probably in the University of California, Berkeley.

*Type Locality*: La Jolla, California.

*General Range*: From British Columbia to Lower California. From 41 to 68 fathoms.

*Local Distribution*: A total of 15 adults was taken west of San José Point, Lower California (Station 175: D-1, 8 adults; D-2, 7 adults) at 45 fathoms on shaley and rocky bottoms.

*Remarks*: The diameter of the largest specimen is 7 mm., length of arms 32 mm.; the disk diameter of the smallest specimen is 2 mm., length of arms 7 mm. The dried specimens have a pink disk with white or gray markings. The arms, orange in life, are pink with an occasional light band; the armspines are white or gray.

Family Ophiotrichidae.

***Ophiotrix galapagensis*** Lütken & Mortensen.

*Ophiotrix galapagensis* Lütken & Mortensen, 1899, p. 181.



*Type*: Cat. No. 2340, M. C. Z. (cotype).

*Type Locality*: Near the Galápagos Islands, Albatross station 3405.

*General Range*: Galápagos Islands, Clarion Island and the Gulf of California. From 20 to 75 fathoms.

*Local Distribution*: A total of 42 specimens was taken from Gorda Banks, Arena Bank, Santa Inez Bay and Clarion Island between 35 and 75 fathoms on sandy, muddy and rocky bottoms.

*Remarks*: These specimens are the first to be collected since 1899 when the species was described from three specimens. The known range of this species has been extended to Clarion Island and the Gulf of California, more than 2,000 miles to the north, by the present record.

All of the specimens are larger than the type, which had a diameter of only 5 mm. The largest specimen in the present series is 13 mm. in diameter. The arm length is about 75 mm.

In the live specimens the disk was purplish blue above spotted with red; arms pinkish-orange, each with a double line of dark oblong spots on upper surface; oral surface white. The color of the dried specimens varies greatly; the disk ranges from cream to maroon with white central markings; medial shields pink with red markings bordering the plates as a marginal line or irregular spotting; disk orally and arm-spines white; arms pink with a median longitudinal white line on dorsal surface.

This species occurred locally in great swarms. About 23,000 specimens, weighing 100 pounds altogether, were taken in a single 10-minute dredge (Station 150: D-18); at Station 150: D-16, 1,682 specimens, and at Station 150: D-4, 360 were captured.

*O. galapagensis* is related to *O. spiculata*, from which it differs by the raised and naked radial shields, by the pinkish color and red markings, by the larger size, longer spines and shape of the arm plates.

*Material*: Station 136: D-7 (7 adults), D-13 (1 adult), D-23 (1 adult), D-24 (2 adults). Station 142: D-3 (4 adults), Station 146: D-1 (3 adults). Station 147: D-2 (1 adult). Station 150: D-4 (8 crushed adults), D-16 (2 adults), D-18 (7 adults and fragments). Station 163: D-2 (6 adults, poor condition).

### ***Ophiothrix spiculata* Le Conte.**

*Ophiothrix spiculata* Le Conte, 1851, p. 318.

*Ophiothrix spiculata*, Nielsen, 1932, p. 251.

*Type*: Cat. No. 2415, M. C. Z. (cotypes).

*Type Locality*: Panama (west coast).

*General Range*: From Monterey Bay, California, to the Bay of Sechura, Peru. From shore to 45 fathoms.

*Local Distribution*: A total of 18 specimens was taken east of Cedros Island, on Arena Bank and in Santa Inez Bay, between 1½ and 45 fathoms on sandy and muddy bottoms.

*Remarks*: These specimens are larger than the types. In life the arms are banded with pink and maroon or brown. The general color varies from light gray and brown to red in the dry specimens. The most colorful of the series has blue radial shields and red disk spines; the arms are blue with a red band about every fourth arm-plate. The arm-spines are dark at the base but become lighter toward the tips. The diameter of the largest specimen is 12 mm., arm length about 40 mm. The smallest specimen has a disk diameter of 5 mm.

*Material*: Station 126: D-3 (1 adult). Station 128: D-1 (5 adults). Station 136: D-1 (4 adults), D-14 (1 adult), D-23 (1 adult). Station 144: D-4 (6 adults).

## Family Ophiochitonidae.

**Ophionereis annulata** (Le Conte).

*Ophiolepis annulata* Le Conte, 1851, p. 317.

*Ophionereis annulata*, Lyman, 1860, p. 203; Nielsen, 1932, p. 309.

*Type*: Cat. No. 1584, M. C. Z.

*Type Locality*: West coast of Panama.

*General Range*: From San Diego, California, to Panama and the Galápagos Islands; Clarion Island. From shore to 20 fathoms.

*Local Distribution*: Two young specimens were taken off Clarion Island (Station 163: D-1) at a depth of 20 fathoms on a bottom formed of coral and rock.

*Remarks*: The disk diameters of the specimens are 5 mm. and 4 mm. respectively. The color (dried) is much lighter than that of the types. The disk and arms are pale bluff, the latter banded with brown every fourth or fifth segment.

**Ophionereis eurybrachiplx** H. L. Clark.

*Ophionereis eurybrachiplx* H. L. Clark, 1911, p. 173.

*Ophionereis eurybrachiplx*, Nielsen, 1932, p. 309.

*Type*: Cat. No. 25589, U. S. N. M. (paratypes Cat. Nos. 3175, 3176, M. C. Z.)

*Type Locality*: Off California.

*General Range*: From Central California to Lower California. From 27 to 45 fathoms.

*Local Distribution*: Two specimens were taken west of San José Point (Station 175: D-1) at a depth of 45 fathoms on a shaley bottom.

*Remarks*: Upon comparison these specimens proved to be almost identical with the types. Their disk diameters are 15 mm. and 20 mm. respectively. The arms are broken but they were about 120 mm. long. The color of the dried specimens is brown; the distal portion of the arms has a light gray median line and lateral markings dorsally.

These specimens extend the known range of the species more than 200 miles to the south along the Pacific coast.

## Family Ophiocomidae.

**Ophiocoma aethiops** Lütken.

*Ophiocoma aethiops* Lütken, 1859, p. 145.

*Ophiocoma aethiops*, Nielsen, 1932, p. 246.

*Type*: Probably in Copenhagen.

*Type Locality*: West coast of Panama.

*General Range*: From Lower California to Panama and the Galápagos Islands; Gulf of California (Arena Bank); Clarion Island.

*Local Distribution*: A total of nine specimens was taken off Arena Bank at 2½ fathoms in coral (*Pocillopora ligulata*) and in tide pools on Clarion Island.

*Remarks*: The largest specimen has a disk diameter of 30 mm.; the smallest disk diameter is 13 mm. The color of the dried specimens is black; only the largest specimen has a gray center, 15 mm. in diameter, on the dorsal side.

*Material:* Station 136: D-33 (8 broken adults). Tide pools, Clarion Island: (1 adult).

***Ophiocoma alexandri* Lyman.**

*Ophiocoma alexandri* Lyman, 1860, p. 256.

*Ophiocoma alexandri*, Nielsen, 1932, p. 248.

*Type:* Cat. No. 1825, M. C. Z. (holotype).

*Type Locality:* Acapulco, Mexico.

*General Range:* From Lower California to Panama and the Galápagos Islands; Clarion Island. From shore to 5 fathoms.

*Local Distribution:* One adult from tide pools, Clarion Island.

*Remarks:* The diameter of the disk is 16 mm., length of arms about 100 mm. The dried specimen is brown with alternating light and dark brown arm bands every few segments.

Family Ophiodermatidae.

***Ophioderma panamense* Lütken.**

*Ophioderma panamense* Lütken, 1859, p. 91.

*Ophioderma panamense*, Nielsen, 1932, p. 327.

*Type:* Probably in Copenhagen.

*Type Locality:* West coast of Panama.

*General Range:* From San Pedro, California, to Payta, Peru, and the Galápagos Islands. From shore to 10 fathoms.

*Local Distribution:* One broken specimen was taken from the shore of Santa Inez Bay.

*Remarks:* In this dried specimen, the 19 mm. disk is brown and the arms are slate brown.

***Ophioderma variegatum* Lütken.**

*Ophioderma variegatum* Lütken, 1856, p. 21.

*Ophioderma variegatum*, Nielsen, 1932, p. 350.

*Type:* Probably in Copenhagen.

*Type Locality:* Realejo, Nicaragua (west coast).

*General Range:* From San Diego, California, to Panama, also at Clarion Island. From shore to 60 fathoms.

*Local Distribution:* A total of 11 specimens was taken from Gorda Banks, Arena Bank, Santa Inez Bay and Clarion Island from shore to 60 fathoms on muddy, sandy and rocky bottoms.

*Remarks:* This series ranges from 7 mm. in diameter to 15 mm.; the arms of the largest specimen are about 55 mm. long. One specimen has only four rays. The common color combination is a red disk dorsally with green, white and narrow black bands on the arms. The oral surface is light cream color, almost white. Two smaller specimens have mottled white and brown disks; the arms are banded, brown and brown with white speckles. In life these specimens were probably more highly colored.

*Material:* Station 136: D-24 (4 adults), D-26 (3 adults). Station 142: D-1 (2 adults). Station 150: D-18 (1 young). Tide-pools, Clarion Island (1 adult).

**Schizoderma diplax** Nielsen.

*Schizoderma diplax* Nielsen, 1932, p. 335.

*Type*: Copenhagen.

*Type Locality*: Perlas Island, Gulf of Panama.

*General Range*: From Lower California to Panama. From shore to 60 fathoms.

*Local Distribution*: A total of 20 specimens was taken from Arena Bank, Gorda Banks and Santa Inez Bay between 29 and 60 fathoms, usually on muddy, rarely on sandy, bottoms.

*Remarks*: This fine series ranges from 7 mm. to 15 mm. in disk diameter. The color (dried) is light brown with dark brown and gray markings on the disk; the arms are gray with brown bands every two to four segments. This series extends the known range of the species more than 2,000 miles to the north, the first record from the Gulf of California.

*Material*: Station 136: D-1 (1 adult), D-14 (1 adult). Station 142: D-1 (3 adults), D-2 (2 adults), D-3 (1 adult), D-4 (2 adults). Station 143: D-1 (3 adults). Station 150: D-8 (5 adults), D-9 (2 adults).

**Diopederma danianum** (Verrill).

*Ophiura danianum* Verrill, 1867a, p. 254.

*Diopederma danianum*, H. L. Clark, 1913, p. 206; Nielsen, 1932, p. 339.

*Type*: Peabody Museum, New Haven.

*Type Locality*: La Union, Salvador (west coast).

*General Range*: Lower California to Salvador, and the Perlas Islands, Gulf of Panama. From 3 to 25 fathoms.

*Local Distribution*: One adult was taken in San Lucas Bay (Station 135: D-20) at a depth of 3 fathoms on a sandy bottom.

*Remarks*: This individual has a disk diameter of 11 mm. The arms are about 33 mm. long. The color of the disk is gray with white and brown markings; the arms are light gray with brown transverse bands every two to three arm segments; the ventral surface is white.

**Ophiuroconis bispinosa** sp. nov.

(Text-figure 2).

*Diagnosis*: Rays five; disk covered dorsally and ventrally with fine granulations; two hyaline arm-spines, three or four oral papillae, tentacle-scale single, scoop-shaped, large, longer than upper arm-plates near the arm-tips.

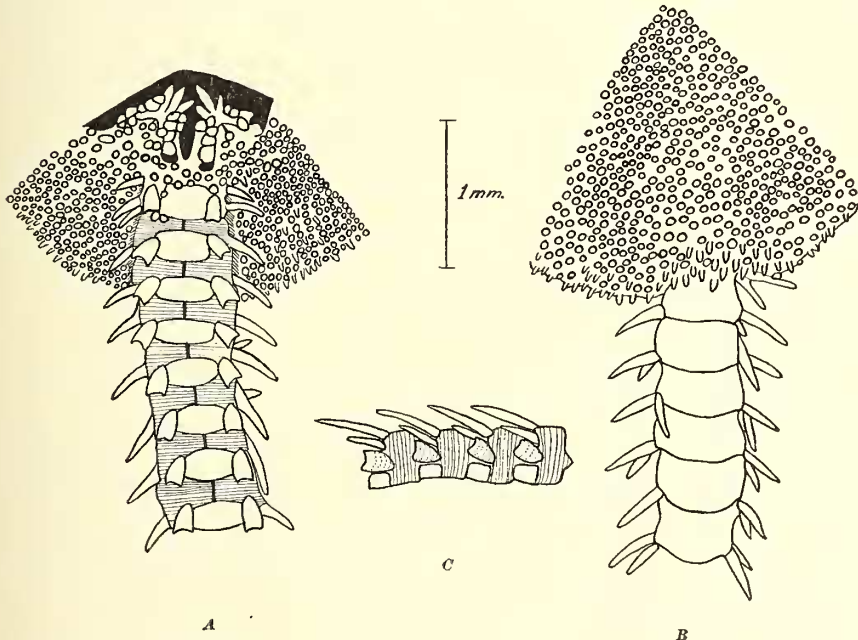
*Description*: Disk 3 mm. in diameter; arms 17 mm. long. Disk circular, thick; radial shields depressed; entire dorsal surface covered with a fine granulation becoming heavier and longer at the margins and over the radial shields. Arms long and slender. Basal upper arm-plates quadrangular, broader than long, distal margins wider than proximal, slightly convex; lateral margins nearly straight; plates broadly in contact throughout, but distally twice as long as wide with distal margin convex and lateral slightly concave.

Interbrachial areas below heavily granulated distally, more sparsely proximally. Genital slits large, but genital plates concealed. Oral shields, mouth shields and proximal ventral arm-plates covered but not concealed by scattered coarse granules; these may occur as far as the distal margin of the fourth under arm-plate. Oral shields triangular with an acute proximal point and concave sides; distal margin smoothly rounded. Adoral plates narrow

and long, about three times as long as wide, acutely pointed proximally and barely meeting within. Oral plates much larger than adorals and covered with granules.

Oral papillae three on each side or possibly four; owing to the granules on the oral plates which are irregular in size, form and position, and to the size and position of the oral tentacles, with accompanying scales, it is difficult if not impossible to be sure how many oral papillae there are. If each oral tentacle is assigned a scale, there are only three papillae on each side, but the large nearly circular scale associated with the second tentacle has the position and relationship of a distal oral papilla and may be considered as such. In that case, there are four oral papillae on each side, the distalmost much the longest; proximal long, slender, acute, pointing toward the mouth; second scale-like, blunt. Tentacle-scale single, relatively very large and of usual form; longer than wide, truncate, markedly convex parallel to its long axis, it resembles a small scoop; distally, it is increasingly longer and narrower so that near the tip of the arm it is two or even three times as long as wide, greatly exceeding the under arm-plates and finally becoming equal to the whole arm-segment. The scales are translucent, concentrically striated.

First under arm-plate well covered with granules; second shield-shaped, hexagonal, with a short straight proximal margin, at each end of which is a markedly concave side, connecting it with the slightly convex lateral margins, which merge in a convex distal end; third and succeeding plates wider than long, with proximal and distal margins slightly convex, and lateral margins slightly concave; distally the plates become quadrangular and widely separated by the side arm-plates. The latter are large, concentrically striated, not meeting above, but fully in contact below; each plate carries on its distal margin two tapering, but not very acute hyaline spines, the



Text-figure 2.

*Ophiuroconis bispinosa* sp. nov. **A**, oral side; **B**, aboral side; **C**, ventro-lateral view of arm showing spines and tentacle-scale.

upper being the longer, about the length of an arm segment, or distally a trifle more. The union of the side arm-plates below forms a slight ridge, which extends to the arm-tip.

The color dried from alcohol is as follows: disk cream color with irregular light brown markings over the radial shields. Arms light tan with bands of brown or black, two to four segments wide (usually two), alternating with a light colored area; near disk, the light and dark bands are four segments wide, but distally they are only half as wide. Lower surface white, with some under arm-plates (usually in pairs) faintly dusky.

*Type:* Cat No. 5422, M. C. Z.

*Material:* One juvenile (the holotype) from San Lucas Bay (Station 135: D-20) at a depth of 3 fathoms on a sandy bottom.

*Remarks:* According to Matsumoto's classification this specimen belongs to *Ophiuroconis*, although it is not typical. Additional material may prove it to be the young of some known species, but in view of its striking peculiarities this seems highly improbable. Compared with specimens of young *Ophioderma*, it is decidedly not the young of any member of that genus.

Family Ophiolepididae.

***Ophiura lütkeni* (Lyman).**

*Ophioglypha lütkeni* Lyman, 1860, p. 197.

*Ophiura lütkeni*, McClendon, 1909, p. 37; Nielsen, 1932, p. 316.

*Type:* Cat. No. 1039, U. S. N. M.

*Type Locality:* Puget Sound, Washington.

*General Range:* From Alaska to Lower California. From 15 to 100 fathoms.

*Local Distribution:* 1,844 young individuals were taken east of Cedros Island (Station 125: D-1) at a depth of 44 fathoms on a muddy bottom. In addition, several bushelsful taken in the same net, were thrown overboard.

*Remarks:* The range in size of these specimens is from 2 mm. to 7 mm. disk diameter. The color (dried) is gray dorsally. In most specimens the disk has one or more white spots; if one, it is usually located in the center. The arm-spines and oral surface are white.

This record extends the known range south to Lower California.

***Ophiolepis crassa* Nielsen.**

*Ophiolepis crassa* Nielsen, 1932, p. 324.

*Type:* Copenhagen.

*Type Locality:* Gulf of Panama.

*General Range:* From the Gulf of California to Panama. From 4 to 75 fathoms.

*Local Distribution:* A total of 35 specimens was taken off Cape San Lucas, on Gorda Banks, on Arena Bank and in Santa Inez Bay between 40 and 75 fathoms on muddy, sandy and rocky bottoms.

*Remarks:* This series ranges from 6 mm. to 15 mm. in disk diameter. The color of the dried specimens is tan with light and dark mottlings, the arms light tan with broad brown bands on every third segment; the short arm-spines are light in color; color in life similar.

These are the first specimens of *crassa* to be recorded from the Gulf of California; the known range is thus extended about 2,000 miles to the north.

*Material:* Station 136: D-1 (1 adult), D-23 (3 adults), D-24 (6 adults), D-26 (5 adults). Station 150: D-8 (2 adults), D-16 (6 adults), D-18 (9 broken adults). Station 151: D-1 (2 adults). Station 142: D-1 (1 adult).

CLASS ECHINOIDEA.

Family Cidaridae.

***Eucidaris thouarsii* (Agassiz & Desor).**

*Cidaris thouarsii* L. Agassiz & Desor, 1846, p. 326.

*Eucidaris thouarsii*, Mortensen, 1928, p. 393.

*Type:* Unknown.

*Type Locality:* Unknown.

*General Range:* Lower California to Panama and the Galápagos Islands. From shore to 50 fathoms.

*Local Distribution:* A total of 17 specimens was taken from Arena Bank and Clarion Island between shore and 50 fathoms on muddy bottoms, in coral (*Pocillopora ligulata*) and in a tide-pool.

*Remarks:* This species is common in the Panamic region, but the young are usually well concealed in coral heads. It has not been previously recorded below 20 fathoms. The present series ranges from 7 mm. to 38 mm. in diameter. Color of dried adults: test almost black, spines purple usually covered with white bryozoan colonies. Young: test reddish-brown, spines red with one to five white bands.

*Material:* Station 136: D-1 (4 young), D-12 (2 young), D-23 (2 young), D-24 (5 young), D-26 (2 young), D-33 (1 adult). Clarion Island tide-pool: (1 adult).

***Hesperocidaris perplexa* (H. L. Clark).**

*Tretocidaris perplexa* H. L. Clark, 1907, p. 205.

*Hesperocidaris perplexa*, Mortensen, 1928, p. 421.

*Type:* Cat. No. 188, M. C. Z.

*Type Locality:* Gulf of California.

*General Range:* Gulf of California and Clarion Island. From 30 to 80 fathoms.

*Local Distribution:* A total of 12 specimens was taken on Gorda Banks, Arena Bank and in Santa Inez Bay between 40 and 80 fathoms on muddy and sandy bottoms.

*Remarks:* This series is well graduated in size from 11 mm. to 52 mm. in diameter. Color of the dried test, green with purple secondary spines and dull green, pink-tipped primary spines.

*Material:* Station 136: D-1 (1 adult), D-7 (1 adult), D-17 (2 adults). Station 142: D-4 (1 adult). Station 150: D-2 (4 young), D-13 (1 young), D-18 (2 young).

Family Centrechinidae.

***Centrechinus mexicanus* (A. Agassiz).**

*Diadema mexicanum* A. Agassiz, 1863, p. 20.

*Diadema mexicanum*, H. L. Clark, 1902, p. 526.

*Centrechinus mexicanus*, H. L. Clark, 1921. Echinoderm Fauna of Torres Strait, p. 145.

*Type*: Cat. No. 635, M. C. Z. (cotypes).

*Type Locality*: Acapulco, Mexico.

*General Range*: From Puget Sound to Panama and the Galápagos Islands. From shore to 20 fathoms.

*Local Distribution*: A total of seven specimens was taken from Clarion Island (Station 163: D-1, 6 young; Sulphur Bay, 1 adult) between 2 and 20 fathoms in rocks and coral.

*Remarks*: These specimens consist of six young and one adult which has a diameter of only 27 mm., while the longest spine is 68 mm. The spines are dark in color, lacking the alternate bands of white found on younger specimens.

Of all the animals encountered in pearl diving, the divers fear this echinoderm most. The spines, which are easily broken when in contact with the body, are covered with a poisonous mucous and being exceedingly sharp penetrate human skin easily. There the tips break off at once and, being retrorsely barbed, it is nearly impossible to remove them; they are, however, rapidly absorbed by healthy tissue. The poison is a bad irritant, but the quantity borne by any one spine is so small that serious results occur only when a great number penetrate at one time; yet the wound caused by one is extremely painful. To add to the hazard the animal is sensitive to light and the passing of a shadow will cause it to project the spines from its well concealed hiding place in coral and rock formations. The present writer has been stung several times when collecting echinoderms. The injured finger soon became inflamed, swollen and discolored. A smarting, burning sensation remained in the finger for more than half an hour, accompanied by a nauseated feeling in the stomach.

### ***Centrostephanus coronatus* (Verrill).**

*Echinodiadema coronata* Verrill, 1867a, p. 294.

*Centrostephanus coronatus*, A. Agassiz, 1872, p. 97; H. L. Clark, 1923, p. 158.

*Type*: Probably in the Peabody Museum, New Haven.

*Type Locality*: Cape San Lucas, Lower California.

*General Range*: From Santa Catalina Island, California, to Cape San Lucas. From shore to 34 fathoms.

*Local Distribution*: One specimen was taken on Arena Bank (Station 136: D-5) at a depth of 34 fathoms on a sandy bottom with abundant weed.

*Remarks*: Test 7 mm. high; diameter 17 mm.; longest spine 33 mm. Color in alcohol, test purple, secondary spines light yellow and pinkish, primary spines white with purple alternating bands. In life all spines were banded with maroon and buff. The spines are brittle, often breaking at the slightest pressure, and are covered with crowded whorls of minute prickles.

### Family Arbaciidae.

### ***Arbacia incisa* (A. Agassiz).**

*Echinocidaris incisa* A. Agassiz, 1863, p. 20.

*Arbacia incisa*, H. L. Clark, 1913, p. 220.

*Type*: Cat. No. 467, M. C. Z. (cotype).

*Type Locality*: Guaymas, Mexico.

*General Range*: From Magdalena Bay, Lower California, to Zorritos, Peru; Gulf of California; Galápagos Islands. From shore to 29 fathoms.



*Local Distribution:* A total of six specimens was taken from Arena Bank and Santa Inez Bay between shore and 29 fathoms on sandy and muddy bottoms and in coral (*Pocillopora ligulata*).

*Remarks:* This is a common species on the west coast of America. The series ranges in size from 6 to 18 mm. in diameter. The color is purple to black; one specimen is gray with purple central markings and light purple spines.

*Material:* Station 141: D-1 (2 young), D-2 (1 adult). Station 143: D-1 (1 young). Santa Inez shore: (1 young). Station 136: D-33 (1 young).

#### Family Echinidae.

### ***Lyctechinus anamesus* H. L. Clark.**

*Lyctechinus anamesus* H. L. Clark, 1912, p. 254.

*Type:* Cat. No. 3916, M. C. Z. (cotype).

*Type Locality:* Off San Diego, California, *Albatross* Station 2930, 60 fathoms.

*General Range:* From Santa Barbara, California, to Point San Bartolome Bay, Lower California, and Guadeloupe Island. From 30 to 60 fathoms.

*Local Distribution:* A total of 24 specimens was taken east of Cedros Island off San José Point, Lower California, between 38 and 45 fathoms on muddy and shaley bottoms.

*Remarks:* A very interesting series, ranging in diameter from 10 to 21 mm. Dried from alcohol the spines are light yellowish green, the test gray with a purplish tinge in the interambulacra. In life the specimens were entirely white.

*Material:* Station 126: D-2 (1 young, 1 test), D-3 (2 adults). Station 127: D-1 (9 adults). Station 175: D-1 (11 adults).

### ***Tripneustes depressus* A. Agassiz.**

*Tripneustes depressus* A. Agassiz, 1863, p. 24.

*Tripneustes depressus*, H. L. Clark, 1912, p. 285.

*Type:* Unknown.

*Type Locality:* Guaymas, Mexico.

*General Range:* Gulf of California, Socorro, Clarion and the Galápagos Islands. From shore to 40 fathoms.

*Local Distribution:* One adult specimen was taken from Clarion Island in the tide-pools west of the landing.

*Remarks:* This specimen has a H. D. of 86 mm. and a V. D. of 46 mm. The test is purple, covered with short white spines.

#### Family Strongylocentrotidae.

### ***Strongylocentrotus fragilis* Jackson.**

*Strongylocentrotus fragilis* Jackson, 1912, p. 128.

*Strongylocentrotus fragilis*, H. L. Clark, 1912, p. 354, pl. 113, figs. 3-6.

*Type:* Cat. No. 3668, M. C. Z.

*Type Locality:* Catalina Island, California.

*General Range:* From Oregon to northern Lower California. From 45 to 638 fathoms.

*Local Distribution:* One young specimen was taken west of San José Point (Station 175: D-1) at a depth of 45 fathoms on a shaley bottom.

*Remarks:* There is only a single specimen at hand and this is but 9 mm. in diameter. The test is reddish, the spines red with white tips. This species has an exceedingly fragile test which is easily crushed in dredging. The known range is extended south into Mexico by this specimen.

Family Echinometridae.

***Echinometra oblonga*** de Blainville.

*Echinus oblonga* de Blainville, 1825, p. 95.

*Echinometra oblongus*, de Blainville, 1830, p. 206; H. L. Clark, 1912, p. 373.

*Type:* Unknown.

*Type Locality:* Unknown.

*General Range:* Hawaiian, Paumotus and Gilbert Islands and westward to Mauritius; also Clarion Island. From shore to 7 fathoms.

*Local Distribution:* Two adults and one young were taken from Sulphur Bay, Clarion Island, in coral (*Pocillopora*) at a depth of 2 fathoms.

*Remarks:* The smallest specimen is 9 mm. high and 17 mm. long, the largest 28 mm. high and 61 mm. long. The spines are short, blunt and almost black in color; the test is dark purple. These individuals do not differ essentially from other specimens previously taken at Clarion Island.

Family Clypeastridae.

***Clypeaster speciosus*** Verrill.

*Clypeaster speciosus* Verrill, 1870, p. 95.

*Clypeaster speciosus*, H. L. Clark, 1914, p. 31.

*Type:* Cat. No. 2203, M. C. Z. (cotype).

*Type Locality:* La Paz, Lower California.

*General Range:* Gulf of California and the Galápagos Islands. From shore to 10 fathoms.

*Local Distribution:* One adult and a dead bleached test were taken from Santa Inez Point, Santa Inez Bay.

*Remarks:* The adult is 77 mm. in length, 68 mm. in width and 18 mm. in height. The color of the dried specimen is dark purple, almost black. The bleached test devoid of spines is 51 mm. in length, 44 mm. in width, 13 mm. in height.

***Clypeaster europacificus*** H. L. Clark.

*Clypeaster europacificus* H. L. Clark, 1914, p. 27.

*Types:* Cat. Nos. 4179, 4180, M. C. Z.

*Type Localities:* Gulf of California and Gulf of Panama.

*General Range:* Gulf of California to Gulf of Panama, Clarion Island and Galápagos Islands. From 7 to 50 fathoms.

*Local Distribution:* A total of six specimens was taken from Arena Bank and Santa Inez Bay between 29 and 50 fathoms on sandy and muddy bottoms.

*Remarks:* The smallest specimens measure 29, 34, 53 and 54 mm. in length; the larger ones 163 and 166 mm. The larger specimens, dull green

in life, are greenish brown when dried; the smaller have a purplish tinge, although the spines are green.

*Material*: Station 136: D-1 (1 adult), D-26 (1 young). Station 142: D-4 (1 adult). Station 143: D-1 (3 young).

#### Family Scutellidae.

##### ***Encope grandis*** L. Agassiz.

*Encope grandis* L. Agassiz, 1841, p. 57.

*Encope grandis*, H. L. Clark, 1914, p. 75.

*Type*: Unknown.

*Type Locality*: Gulf of California. From shore to 10 fathoms.

*Local Distribution*: One young specimen was taken in San Lucas Bay (Station 135: D-20) at a depth of three fathoms on a sandy bottom, and two bleached tests from Santa Inez Point, Santa Inez Bay.

*Remarks*: The tests are 76 and 94 mm. in length. The larger specimen had evidently been dead for some time as the surface of the test is scarred by worms. The smaller test is well preserved. The very young specimen, which is probably *grandis*, measures 22 mm. in length and 23 mm. in width. It corresponds well with other small specimens in the M. C. Z. collection.

##### ***Encope micropora*** L. Agassiz.

*Encope micropora* L. Agassiz, 1841, p. 50.

*Encope micropora*, H. L. Clark, 1914, p. 74.

*Type*: Unknown.

*Type Locality*: Apparently the Galápagos Islands.

*General Range*: From Lower California to the Bay of Sechura, Peru, and the Galápagos Islands. From shore to 45 fathoms.

*Local Distribution*: One adult specimen was taken on Arena Bank (Station 136: D-1) at a depth of 45 fathoms on a muddy bottom.

*Remarks*: This specimen measures 100 mm. in width and 91 mm. in length. The margin of the test is irregular, having been bitten off or broken. The color of the dried individual is a light mouse gray.

#### Family Spatangidae.

##### ***Brissopsis pacifica*** (A. Agassiz).

*Toxobrissus pacificus* A. Agassiz, 1898, p. 82.

*Brissopsis pacifica*, Mortensen, 1907, p. 44; H. L. Clark, 1914, p. 203.

*Type*: Cat. No. 3063, M. C. Z.

*Type Locality*: Off Panama, 7° 12' 20" N. Lat., 80° 55' W. Long. 182 fathoms.

*General Range*: Southern California to Panama. From 38 to 284 fathoms.

*Local Distribution*: A total of five specimens was taken east of Cedros Island, and off San José Point, Lower California, between 38 and 56 fathoms on muddy and shaley bottoms.

*Remarks*: Two of the specimens are badly crushed. The smallest individual is 16 mm. long, 13 mm. wide and 9 mm. high; the largest is 51 mm.

long, 42 mm. wide and 25 mm. high. The color in life was white; in alcohol it is light brown, the peripetalous fasciole is almost black; dried specimens are of a greenish-brown tinge.

*Material*: Station 126: D-6 (1 young, 1 adult), D-9 (fragments of an adult). Station 127: D-1 (fragments of an adult). Station 175: D-1 (1 young).

### ***Meoma grandis* Gray.**

*Meoma grandis* Gray, 1851, p. 132.

*Meoma grandis*, H. L. Clark, 1917, p. 220.

*Type*: Probably in the British Museum.

*Type Locality*: "Australia" (Captain E. D. Belcher). Probably the west coast of tropical America.

*General Range*: Gulf of California and the west coast of Mexico. From 20 to 60 fathoms.

*Local Distribution*: Two specimens and fragments of another were taken on Arena Bank, Gorda Banks and in Santa Inez Bay, between 40 and 60 fathoms on muddy bottoms.

*Remarks*: The larger specimen has a length of 100 mm., width of 92 mm. and height of 47 mm. The smaller specimen is 90 mm. long, 82 mm. wide and 40 mm. high. The color of the dried specimens is brown with a purplish tinge, spines greenish-brown, tips of spines yellow.

*Material*: Station 136: D-23 (1 adult). Station 141: D-4 (1 adult). Station 150: D-18 (fragments of an adult).

### ***Lovenia cordiformis* A. Agassiz.**

*Lovenia cordiformis* A. Agassiz, 1872, p. 57.

*Lovenia cordiformis*, H. L. Clark, 1917, p. 254.

*Type*: Cat. No. 3188, M. C. Z. (cotype).

*Type Locality*: Guaymas, Mexico.

*General Range*: From Santa Barbara, California, to Guayaquil, Ecuador, Galápagos Islands and Hawaiian Islands. From 8 to 54 fathoms.

*Local Distribution*: A total of five specimens was taken east of Cedros Island and in Santa Inez Bay between 25 and 40 fathoms on muddy and sandy-mud bottoms.

*Remarks*: This interesting series contains four young, the smallest being 16 mm. in length, 11 mm. in width and 8 mm. in height. The largest specimen is 39 mm. long, 30 mm. wide and 16 mm. high. In life the specimens ranged from grayish-green to white. The color of the dried material is gray, the large spines purplish. There are indubitable specimens of this species in the M. C. Z. from Maui, Hawaiian Islands.<sup>3</sup>

*Material*: Station 126: D-3 (1 adult). Station 143: D-4 (4 young).

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<sup>3</sup> Not yet recorded in the literature, as far as I am aware.

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